APPENDIX A

Maps

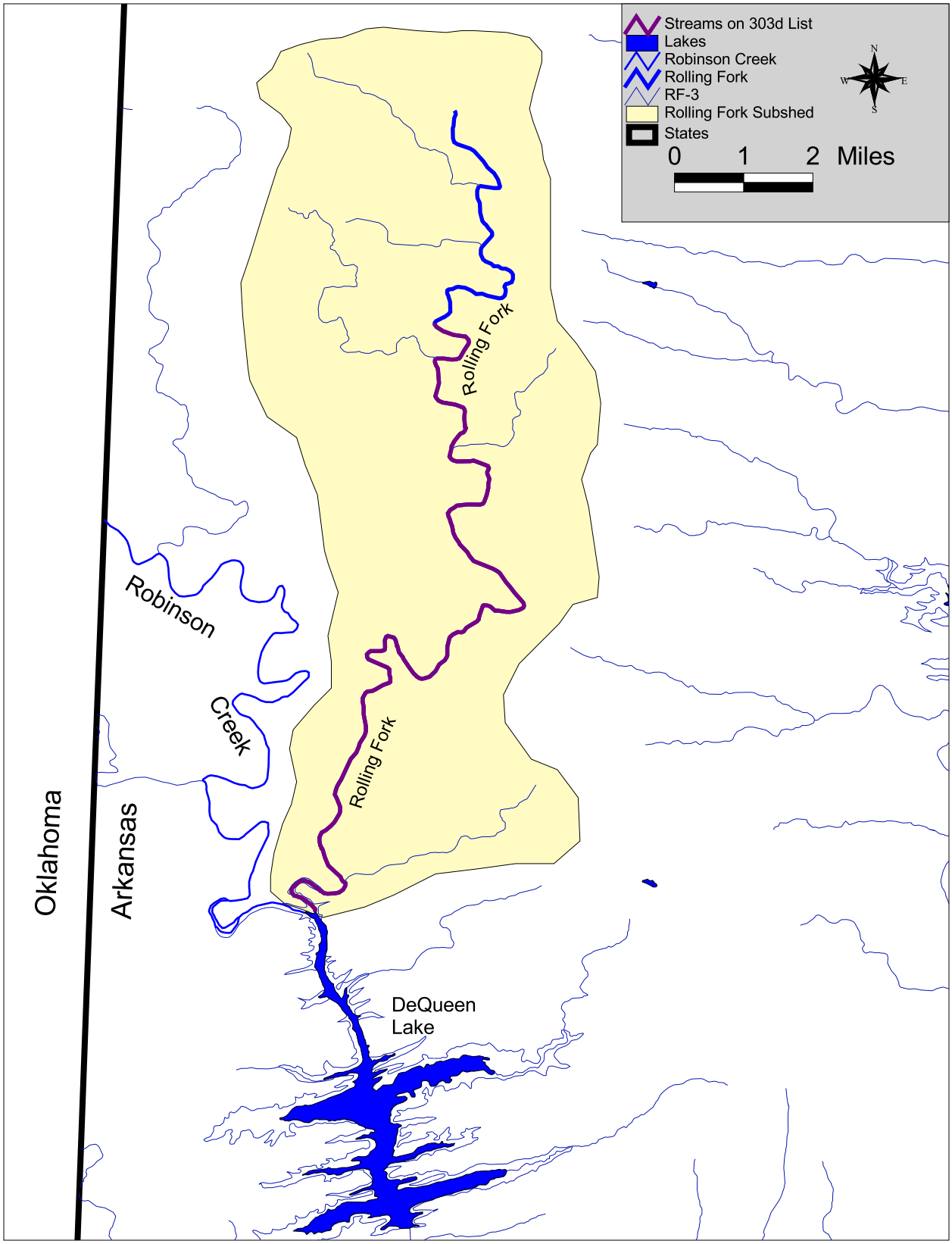


Figure A.1. Map of the study area.

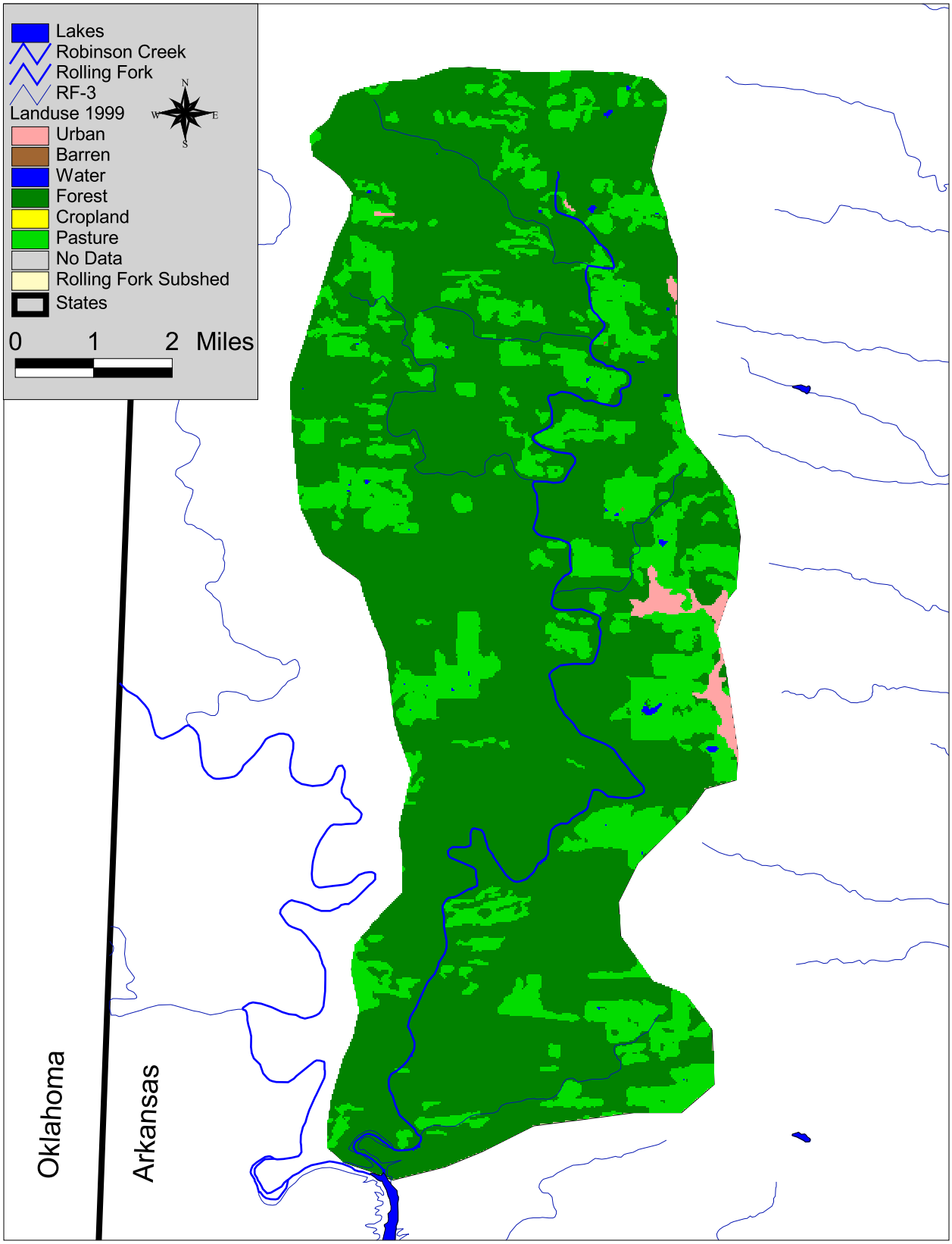


Figure A.2. Land use map.

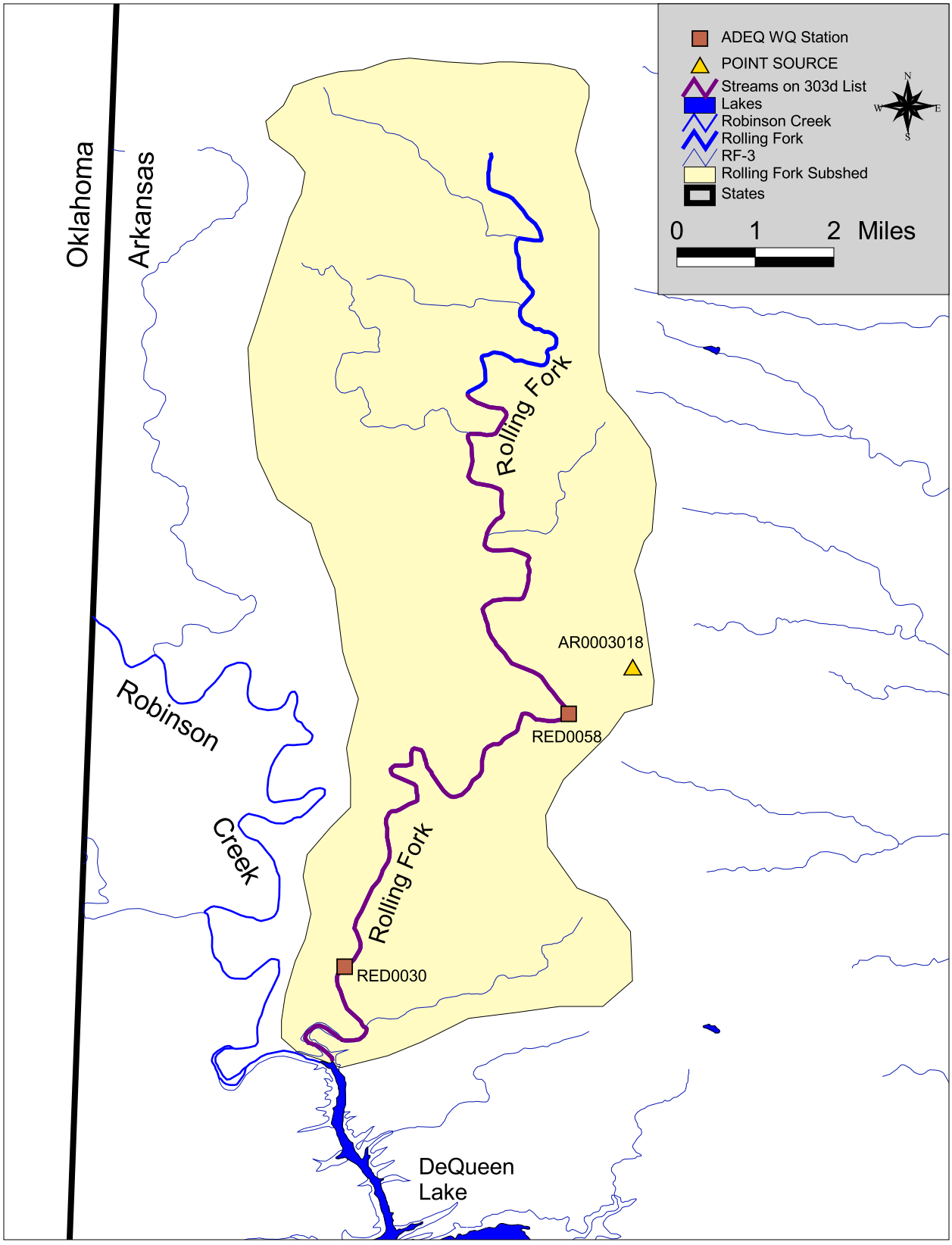


Figure A.3. Map of point source and sampling station locations.

APPENDIX B

Time Series Plots of Nitrate+Nitrite and Phosphorus

Figure B.1. Time Series Plot of Nitrate+Nitrite Concentratiion at Station RED0058

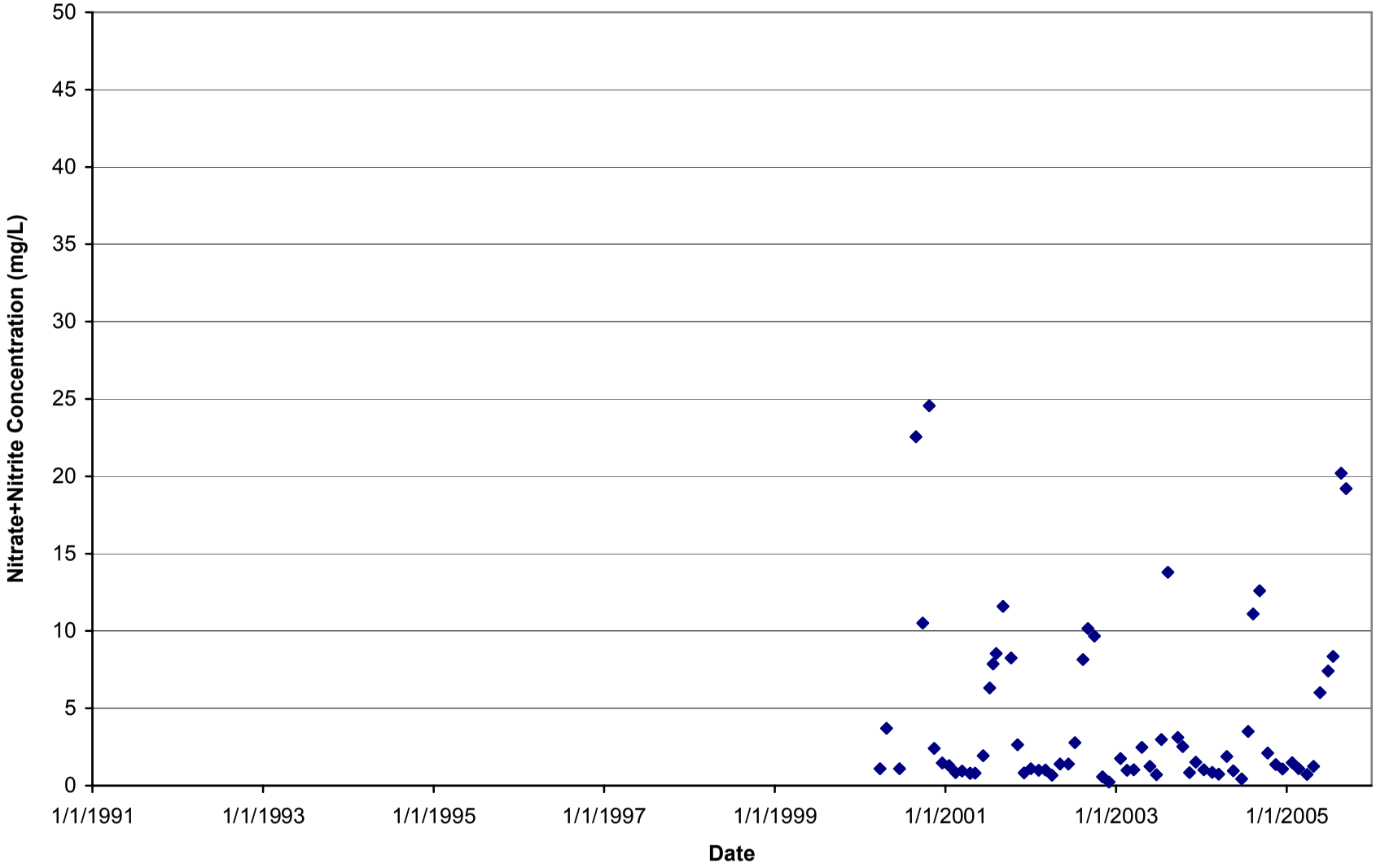


Figure B.2. Time Series Plot of Nitrate+Nitrate Concentration at Station RED0030

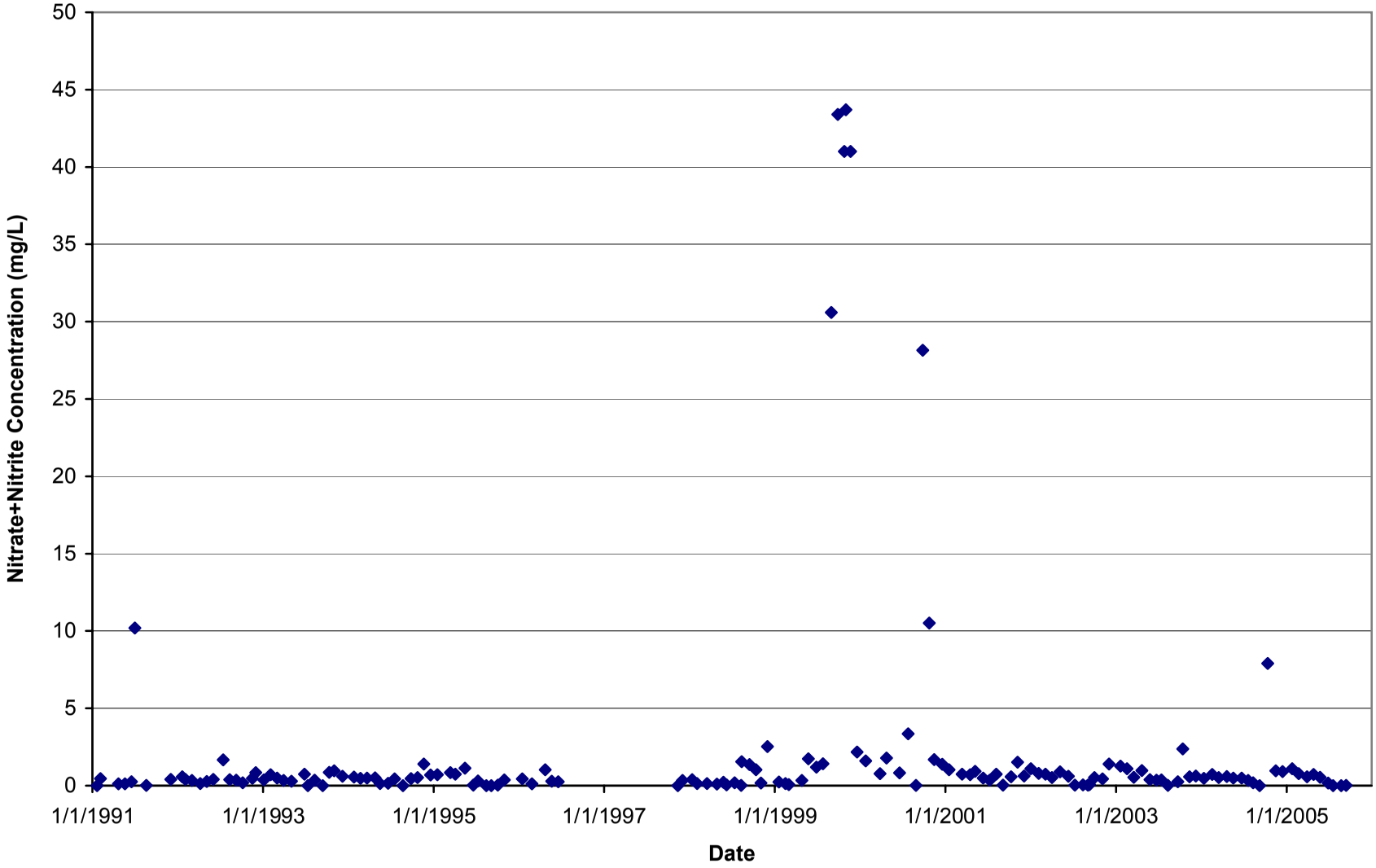


Figure B.3. Time Series Plot of Total Phosphorus Concentration at Station RED0058

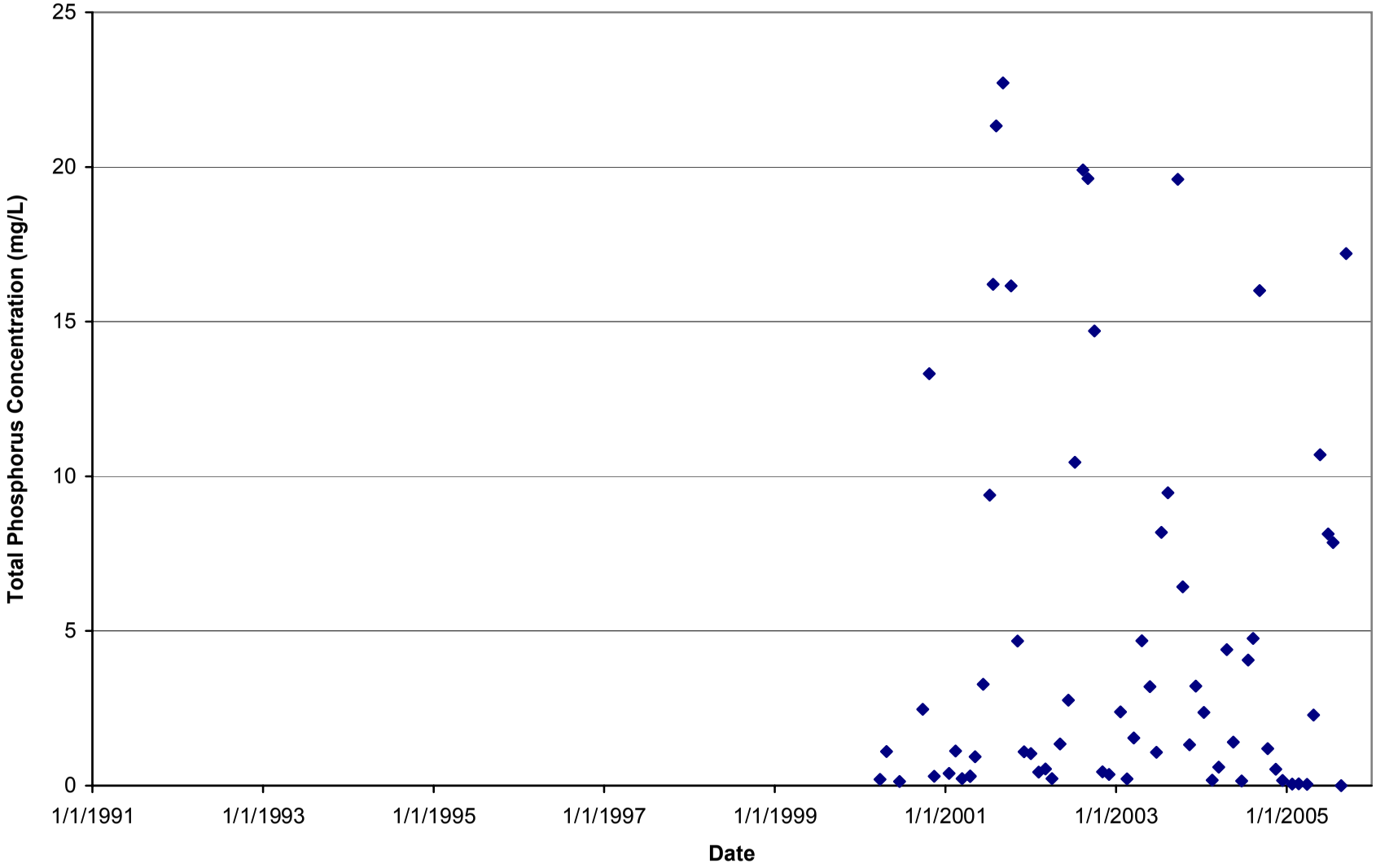
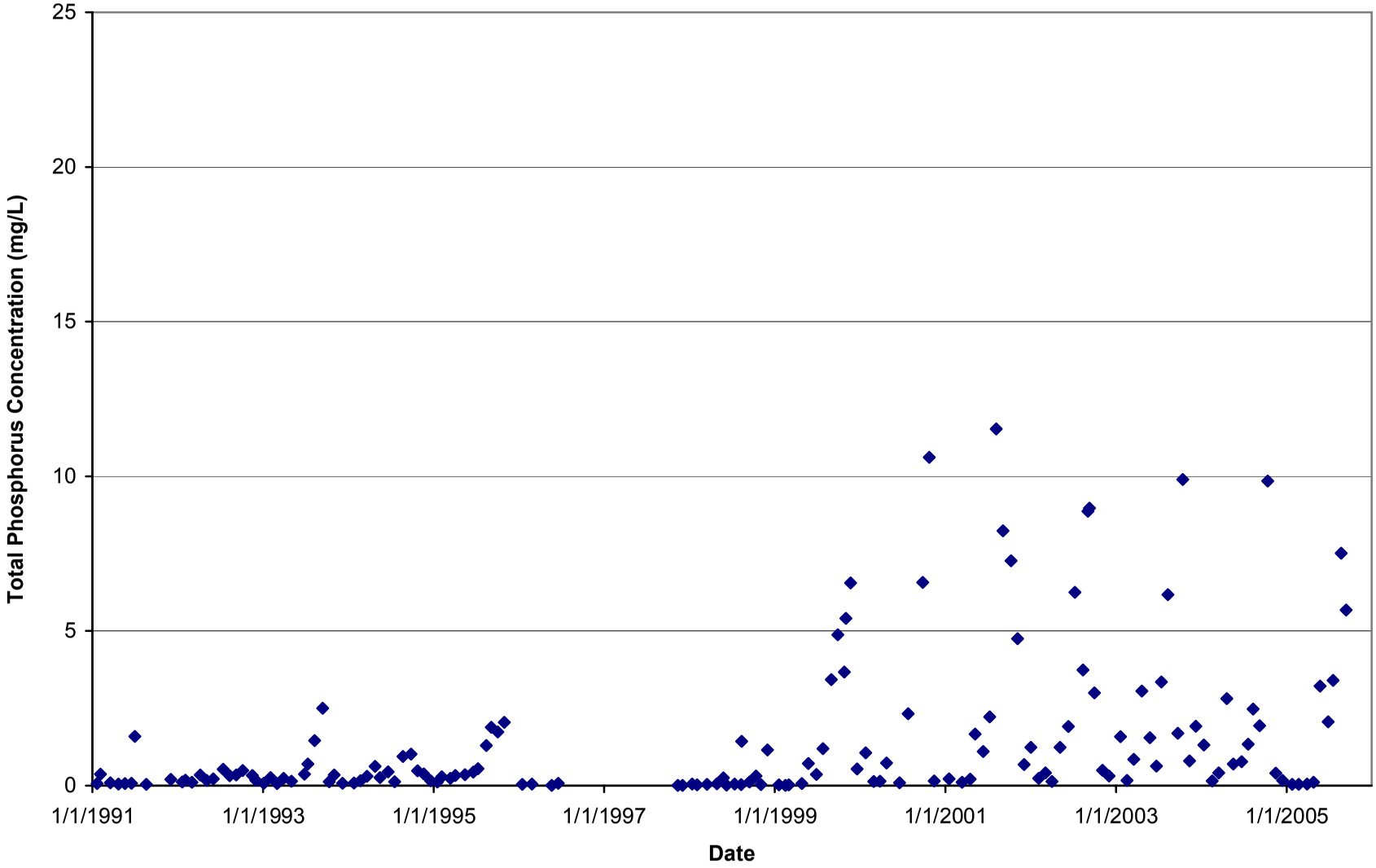


Figure B.4. Time Series Plot of Total Phosphorus Concentration at Station RED0030



APPENDIX C

Seasonal Plots of Nitrate+Nitrite and Phosphorus

Figure C.1. Seasonal Plot of Nitrate+Nitrite Concentration at Station RED0058

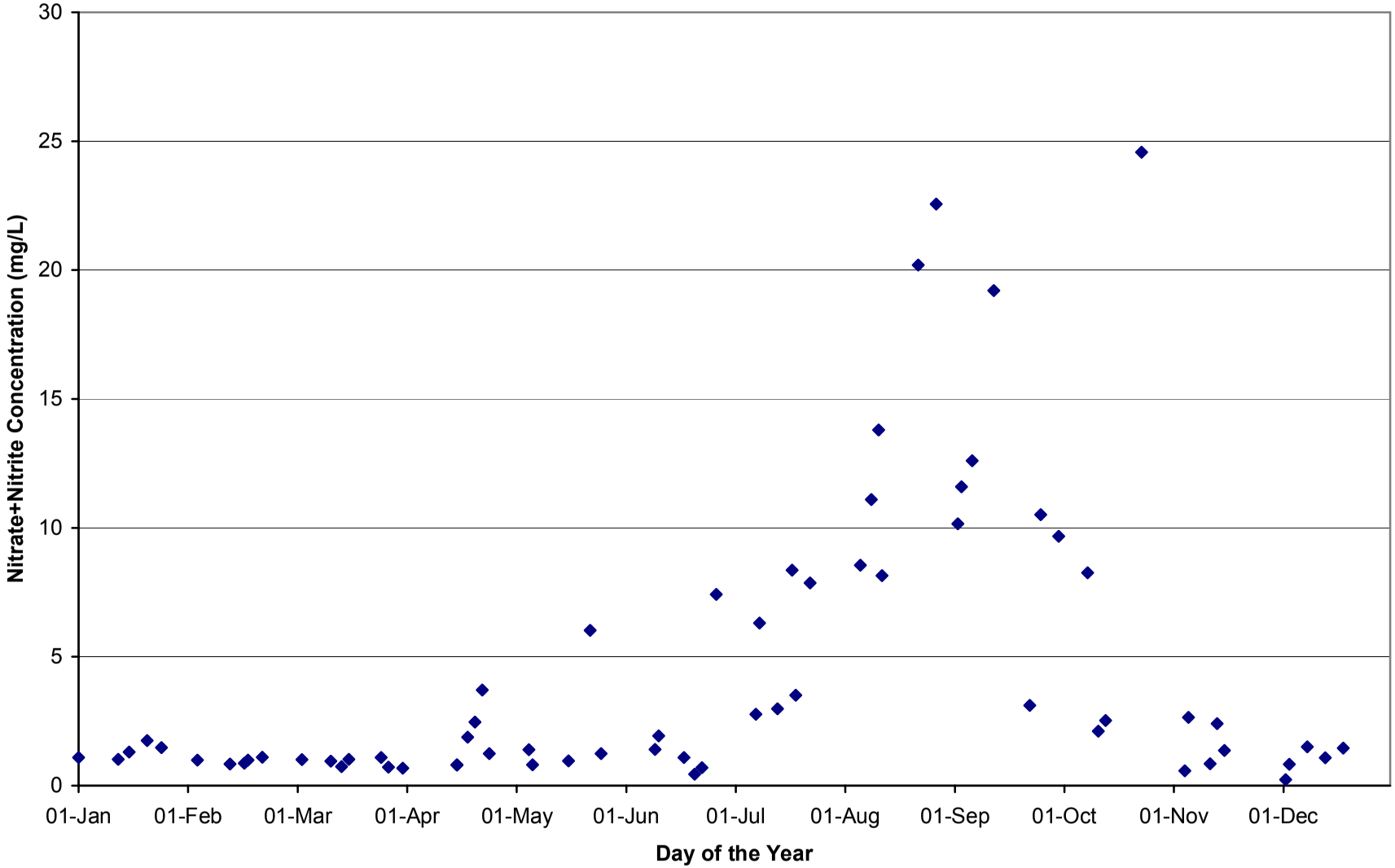


Figure C.2. Seasonal Plot of Nitrate+Nitrite Concentration at Station RED0030

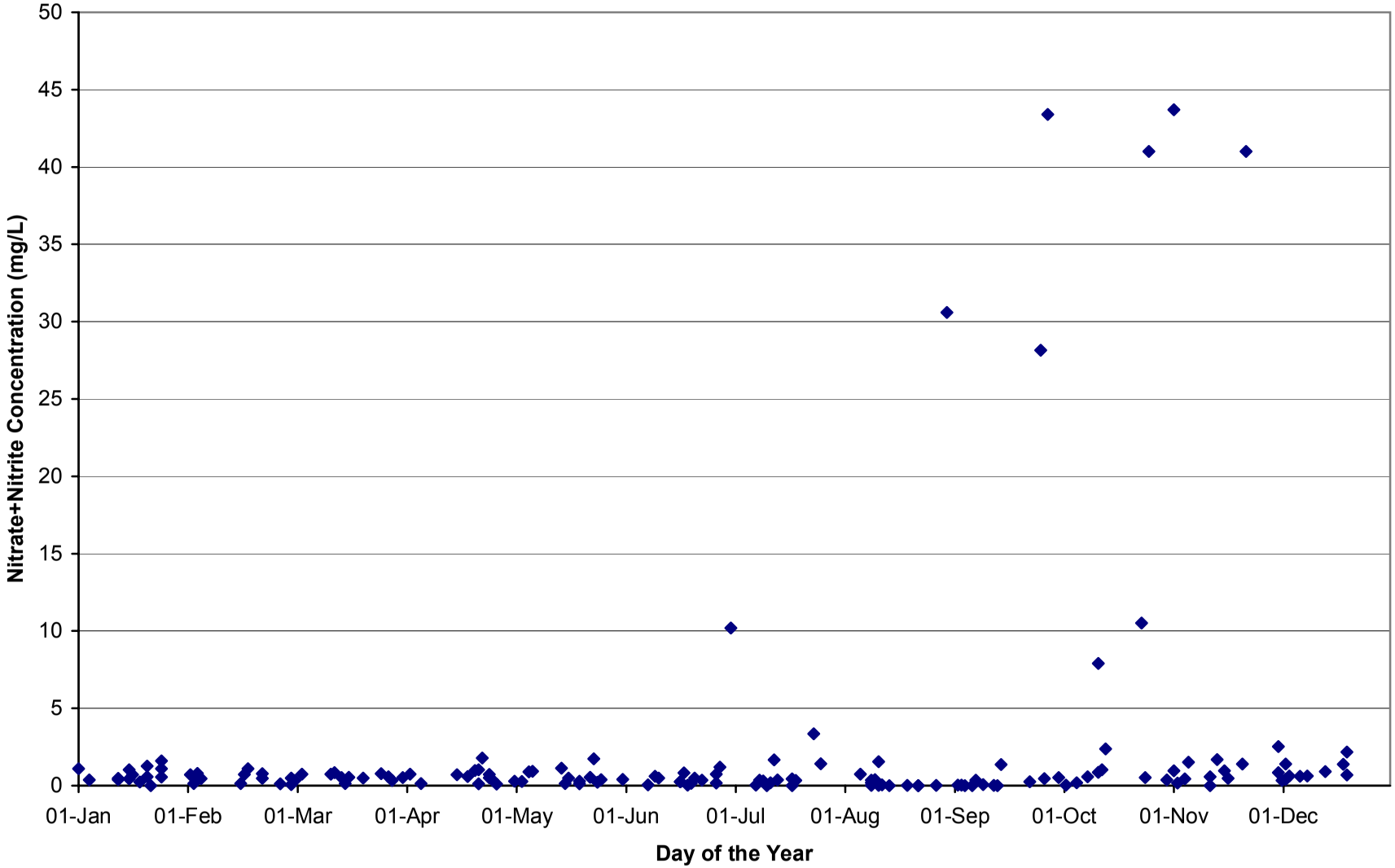


Figure C.3. Seasonal Plot of Total Phosphorus Concentration at Station RED0058

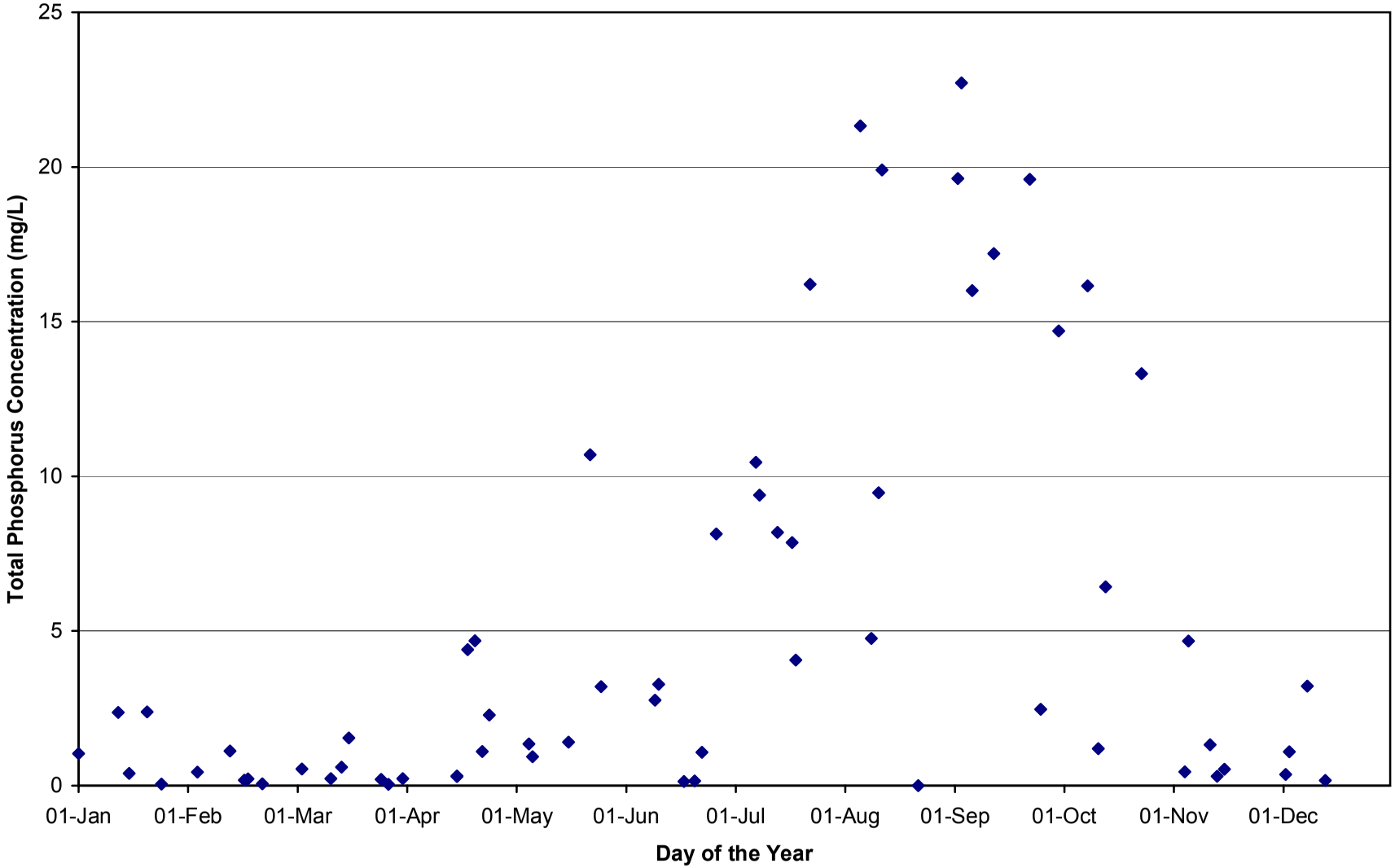
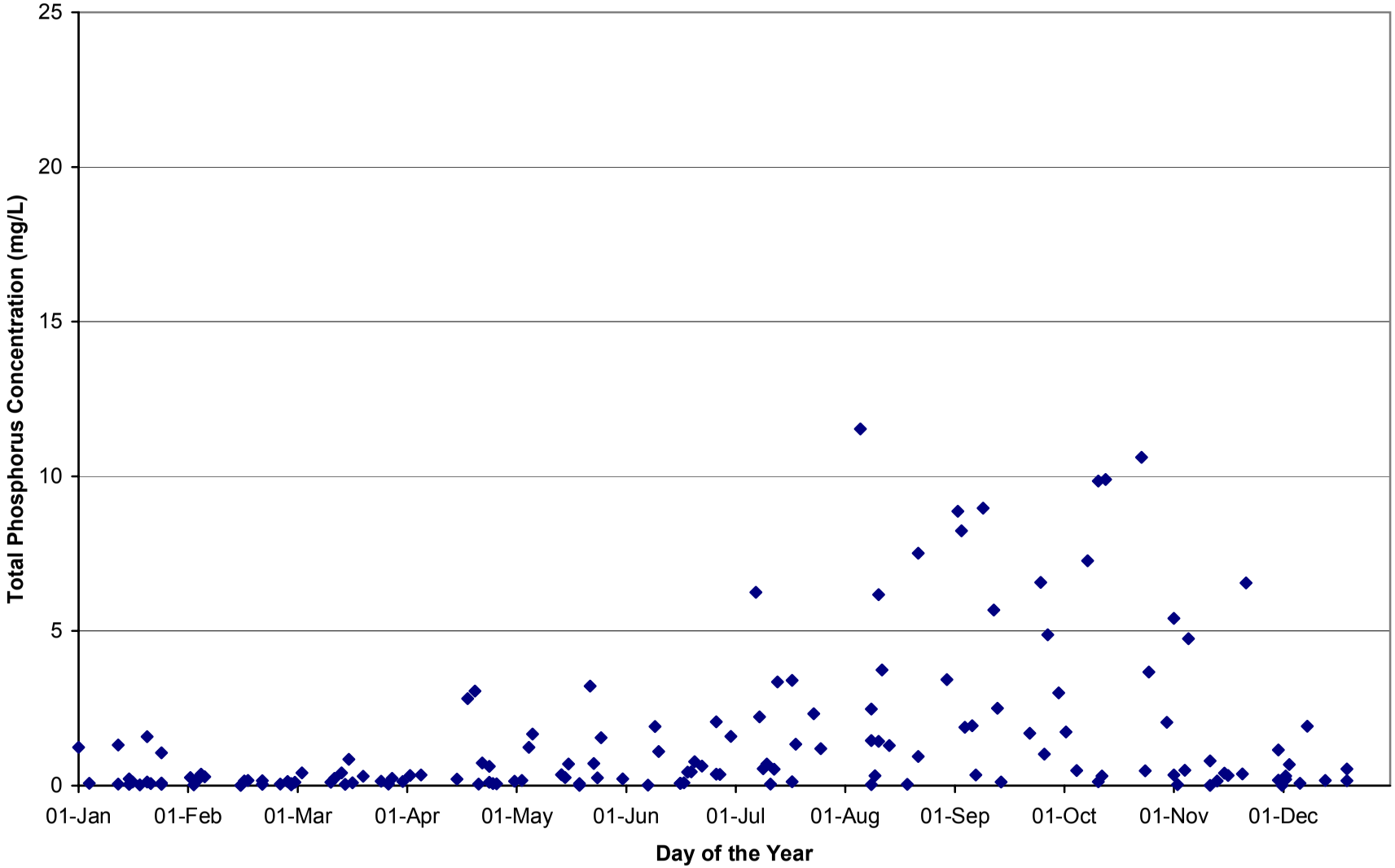


Figure C.4. Seasonal Plot of Total Phosphorus Concentration at Station RED0030



APPENDIX D

Plots of Nitrate+Nitrite and Phosphorus Concentrations vs. Flow

Figure D.1. Plot of Nitrate+Nitrite Concentration at Station RED0058 versus Stream Flow

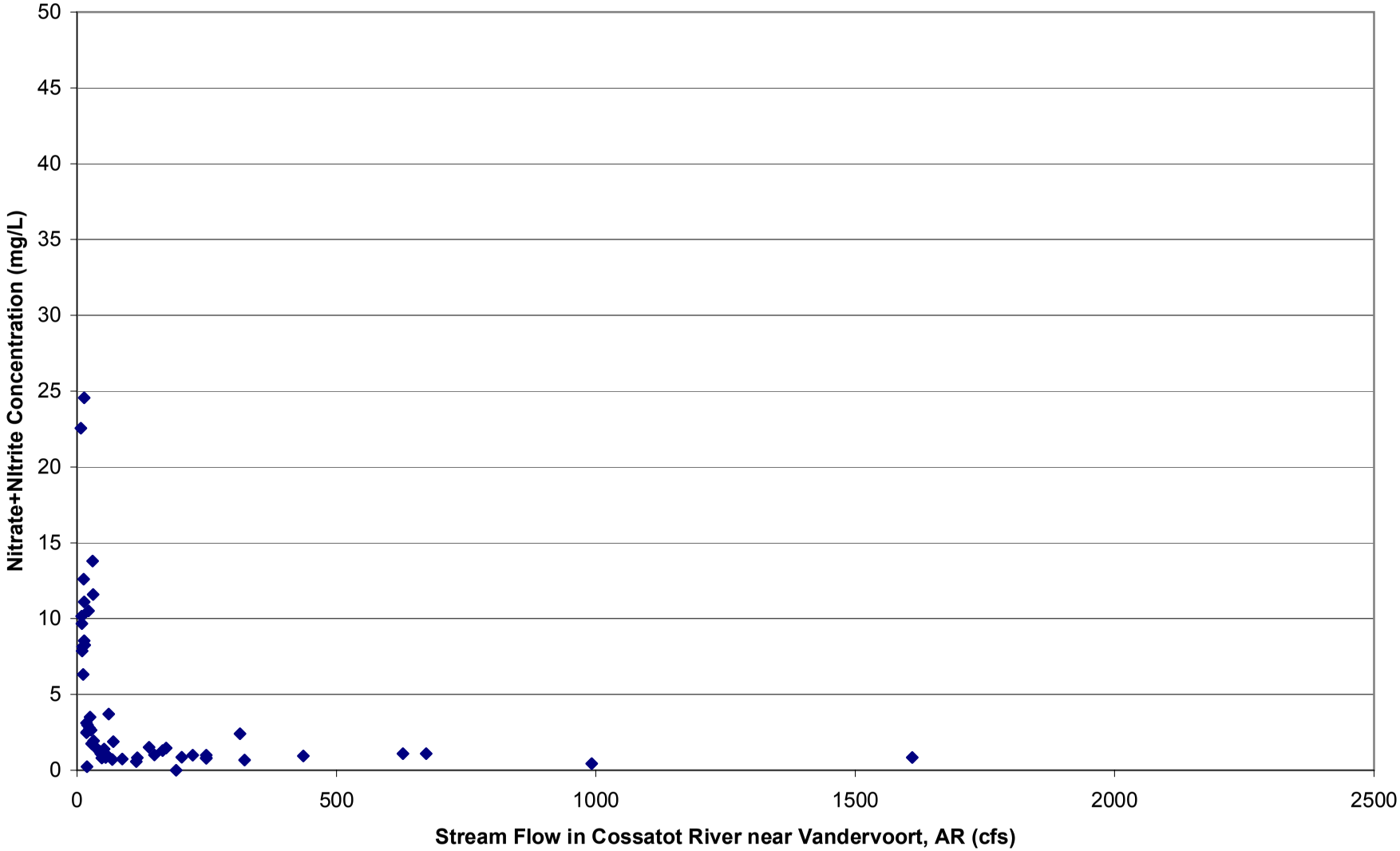


Figure D.2. Plot of Nitrate+Nitrite Concentration at Station RED0030 versus Stream Flow

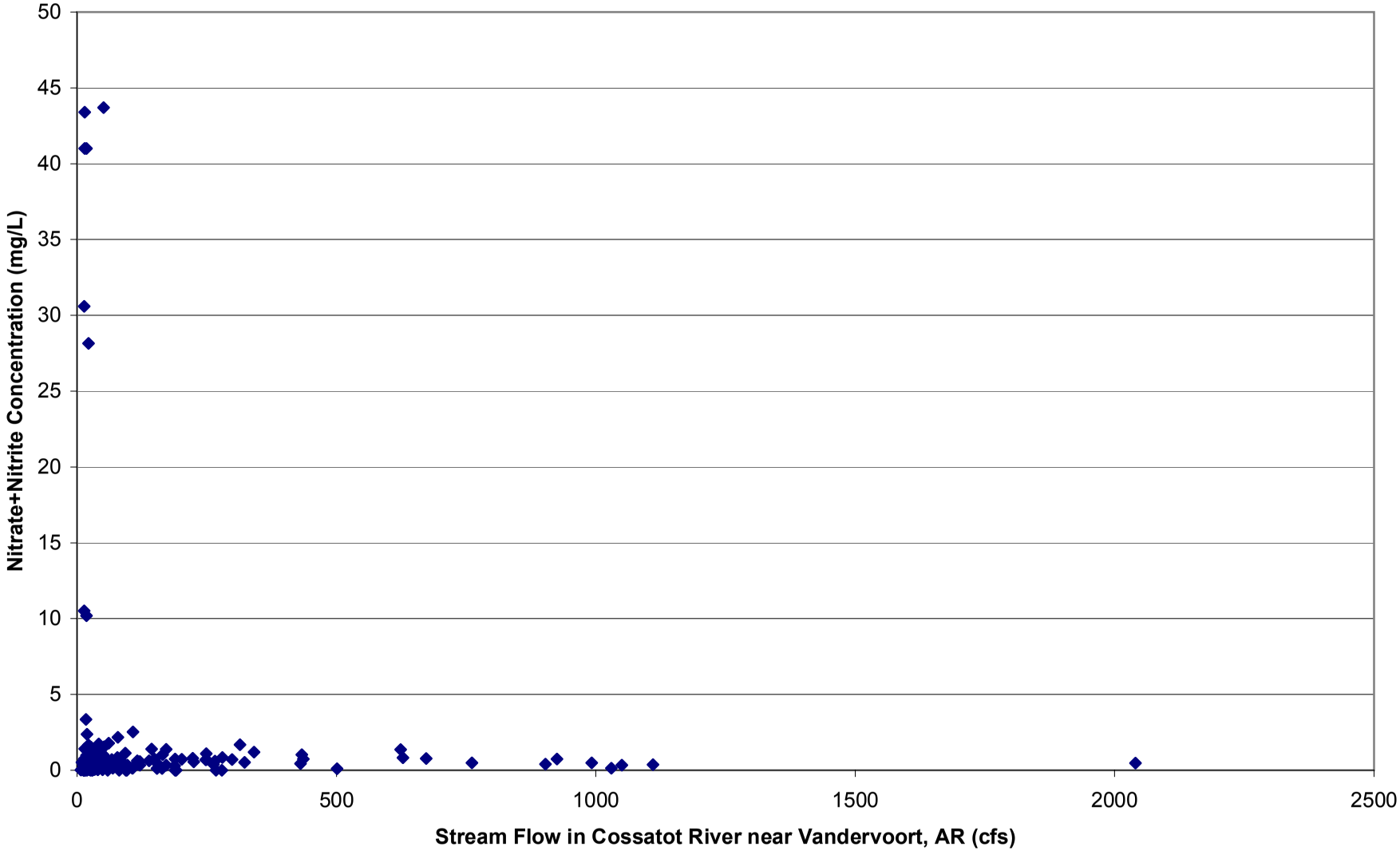


Figure D.3. Plot of Total Phosphorus at Station RED0058 versus Stream Flow

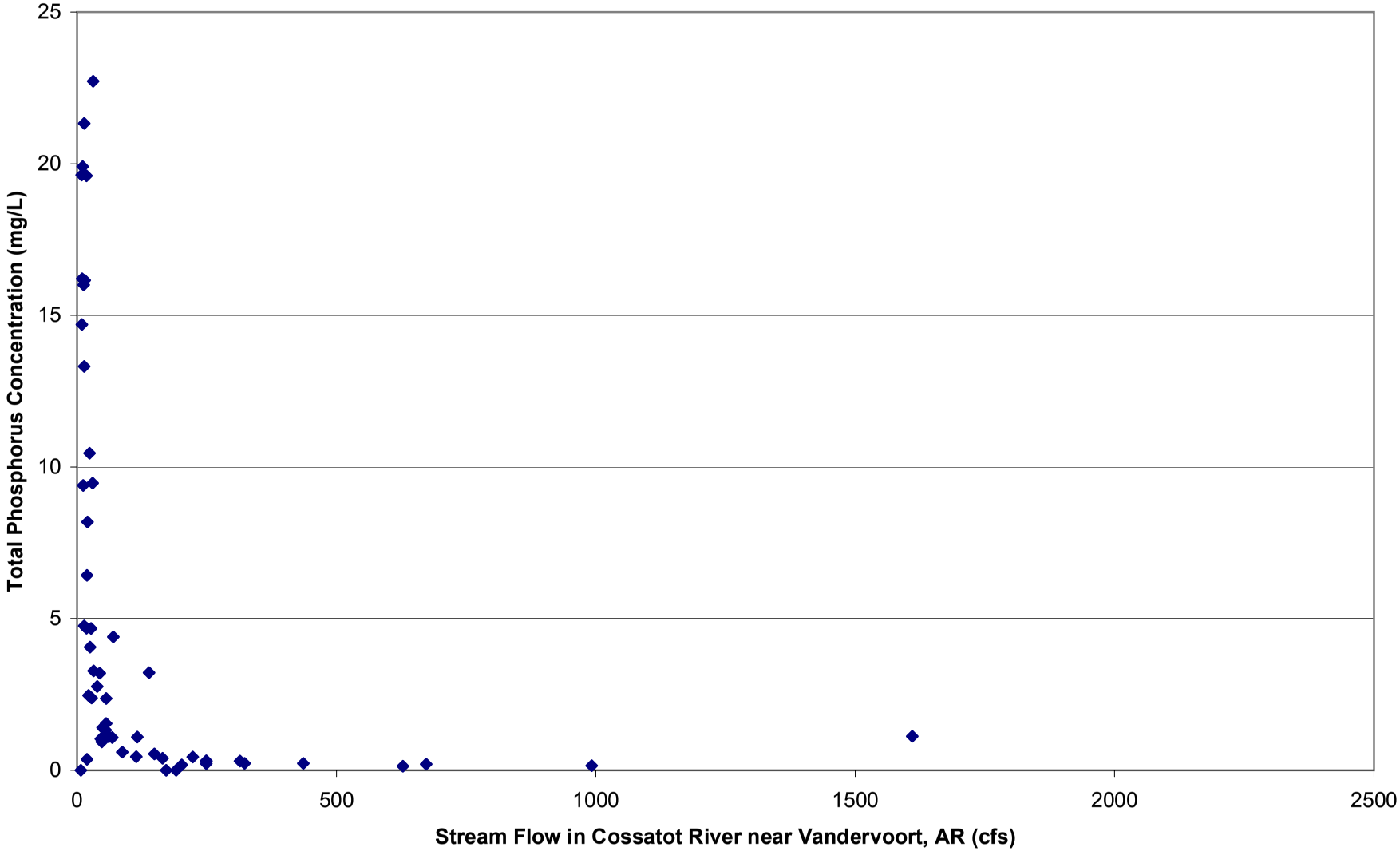
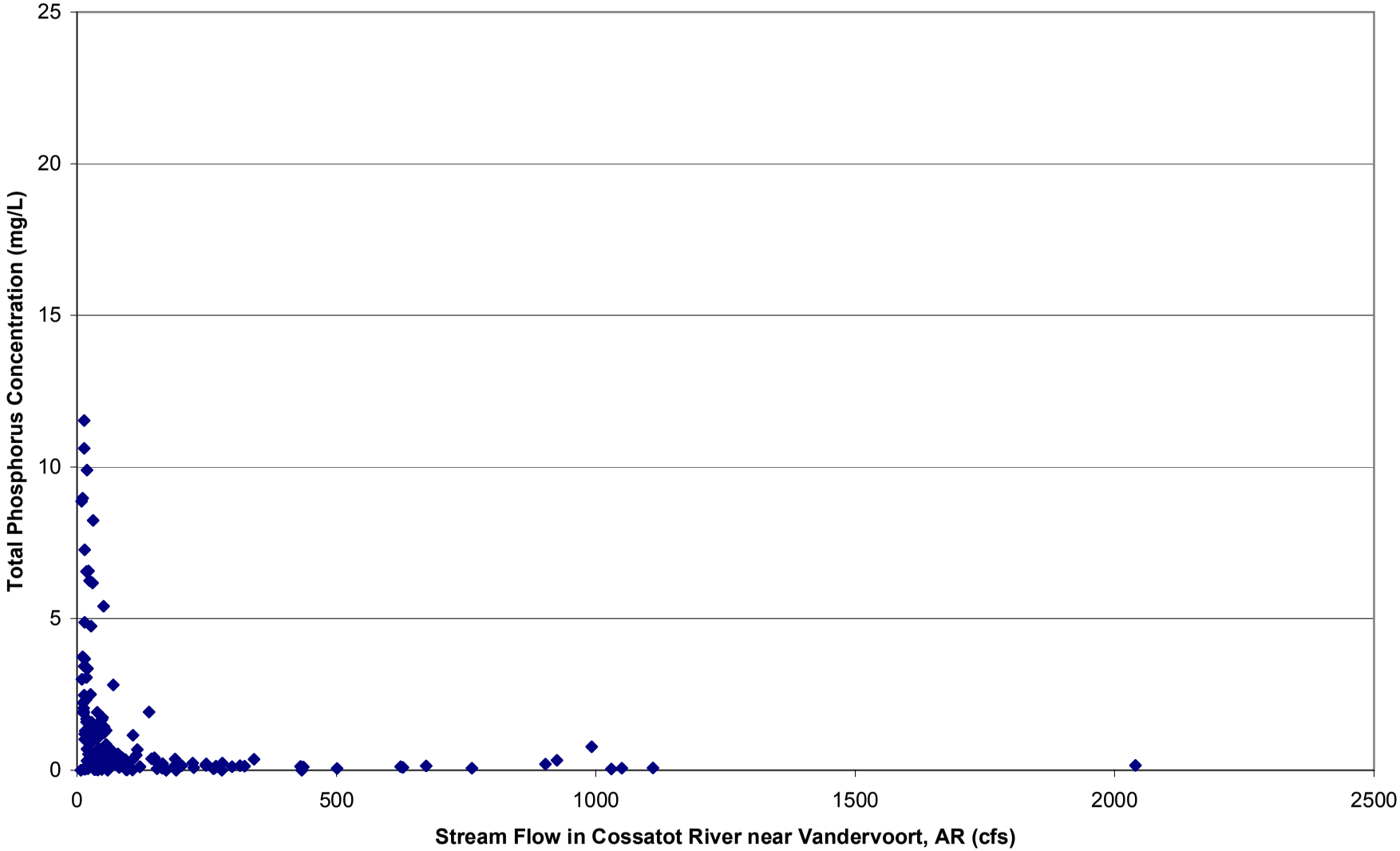


Figure D.4. Plot of Total Phosphorus at Station RED0030 versus Stream Flow



APPENDIX E

Public Comments and Responses

PUBLIC COMMENTS AND RESPONSES
TMDLs FOR NITRATE AND PHOSPHORUS IN ROLLING FORK
January 10, 2006

Comments that were received by EPA during the public comment period are shown below with EPA responses inserted in a different font.

COMMENTS FROM TYSON FOODS, INC.:

The Arkansas Department of Environmental Quality (ADEQ) published proposed changes to the Impaired Waterbodies List (303d list) on February 20, 2005. Since that time, the Arkansas information has been forwarded to EPA. Currently, EPA Region 6 has prepared 43 TMDLs and the calculations for these TMDLs for waters listed in the state of Arkansas under section 303(d) of the Clean Water Act (CWA). EPA is allowing comment on the 43 proposed TMDL's until December 12, 2005.

Tyson Foods, Inc. (Tyson) is respectfully submitting this letter to offer comments regarding one of the streams included on the proposed 303d list. This stream is the Rolling Fork which is located in the southwestern portion of Arkansas. The Rolling Fork is also located near a Tyson process facility in Grannis, AR. The Rolling Fork is listed as a category 5A stream for Nitrates, Total Phosphorous, and Copper with industrial sources being the primary influence.

No aquatic life use impairment is documented for this stream segment. Conversely, a 1998 water quality study completed by ADPC&E found that the fish community was "generally supporting" the designated use and that the macroinvertebrate community has an "impairment status" of "none". Therefore, the stream should not be on the 303(d) list and the TMDL for nitrate and phosphorus is not necessary.

Response: The determination of impairment for the Rolling Fork was originally made by ADEQ a number of years ago. ADEQ considered this stream to be impaired because they included it in category 5a on the 2002 303(d) list. ADEQ still considers this stream to be impaired. It is in category 5a on the 2004 draft 303(d) list. During the public comment period for the draft 303(d) list, Tyson requested that the 303(d) listing for Rolling Fork be moved into category 5c or 5d. ADEQ rejected that request in their Responsiveness Summary to Comments on the draft 303(d) list (dated July 15, 2005).

Tyson provides comments concerning Nitrates as follows:

The nitrate target for the TMDL is unrelated to the listed impairment and can not be used as a scientifically defensible endpoint for the Rolling Fork or its tributary. The TMDL

uses a target nitrate concentration of 10 mg/L. This target is noted as being protective of the "…designated use of domestic water supply". This segment of the Rolling Fork was the subject of a Use Attainability Analysis and is listed in the current Arkansas Water Quality Standards with a "Use Variation Supported by UAA" designation where the domestic water supply use has been removed. There is no designated use for domestic water supply for the Rolling Fork therefore the 10 mg/L target for nitrate (which is the EPA drinking water criteria) is over conservative and should not be used in the TMDL.

Response: The removal of the domestic water supply use for Rolling Fork was already mentioned in Section 2.4.1 of the report. The nitrate criterion for domestic water supply use must still be considered for this TMDL because the next two downstream waterbodies (11140109-027 and –026)do have domestic water supply as a designated use. Further, the 10 mg/L was selected as the target for this TMDL because it is considered to be a reasonable value that is not overly stringent and will be protective of designated uses in the impaired reach of Rolling Fork as well as in downstream waterbodies.

According to existing ambient monitoring data (2000-2005) at station ARK0058 and ARK0030 the nitrate TMDL is currently being met during average conditions downstream of the discharge. The TMDL report establishes a Nitrate TMDL of 6,025 lbs/day. The in stream nitrite plus nitrate levels on average do not exceed 4.6 mg/L. Therefore, the existing average load is no more than 2,770 lbs/day at average flow, well below the recommended TMDL. In addition the 80th percentile nitrite plus nitrate level at ARK0058 is only 8.3 mg/L and the 90th percentile is 11.9 mg/L (the 90th percentile nitrate level at ARK0030 is <2.0 mg/l), indicating that the recommended in stream target (which, as described previously, is an inappropriate target) is rarely exceeded. Therefore, a nitrate TMDL is unnecessary and the current effort should be used to de-list the segment for nitrate.

Response: The historical average nitrate concentrations in Table 3.1 of this report are consistent with the statistics mentioned above for station RED0058. A TMDL for nitrate was still required because the nitrate impairment for Rolling Fork has been on the 303(d) list since at least 1998 and it is included in the consent decree from the Arkansas TMDL lawsuit.

Assignment of a 10 mg/L nitrate limit to the Tyson Foods discharge was not developed based on a technically supported implementation process, or supported by the TMDL process. Water quality based NPDES permit limits should be assigned on the basis of attaining an in stream standard designed to protect designated uses (in this case the aquatic life use), not as an arbitrary value designed to maintain a non-existent use. The allowable loading of nitrate assigned to the Tyson facility is inconsistent with the TMDL

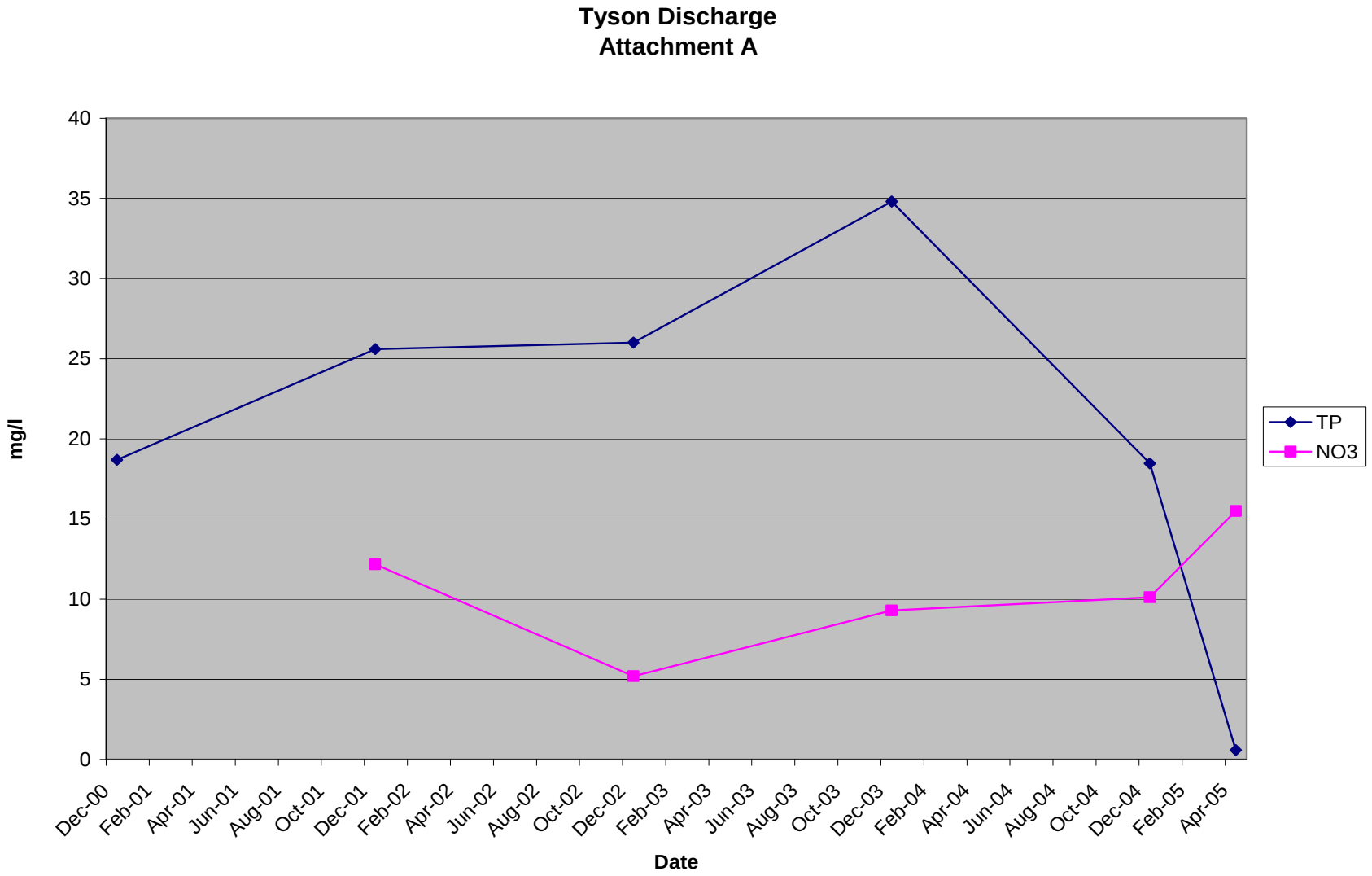
developed for the Rolling Fork. The WLA for nitrate would be much higher than allowed by the 10 mg/L drinking water permit based limit recommended.

Response: See first response to comments about the nitrate target concentration (page 2). The permit limit of 10 mg/L was considered appropriate to maintain designated uses in this reach of Rolling Fork as well as for downstream waterbodies.

Tyson has also made modifications at its Grannis processing facility that should be considered when considering the development of a Nitrate TMDL. Tyson modified the design of the wastewater began in 2001 that led to reduced discharge of Nitrate Nitrogen levels. The effluent from the wastewater treatment system has consistently been below 20 mg/l during this four year period. Based on data obtained from ADEQ monitoring station RED58, the in-stream concentrations for Nitrate Nitrogen has consistently reduced during the past four years. However, the in-stream monitoring data shows a cyclical increase in Nitrate Nitrogen between August and October each year. Since the in-stream monitoring results are not consistent with the discharge levels associated with the Tyson location, it would appear the elevated Nitrate Nitrogen levels could possibly be a natural cycle that occurs within the stream. Other than the data obtained during the fall, the in-stream concentration level is fairly consistent. Tyson has included a graph of the Grannis effluent concentrations (Attachment A) and a graph of the Grannis effluent in conjunction with the in stream data (Attachment B). The graphs indicate the increased Nitrate levels in the stream are not the result of a discharge from the Tyson facility or any other industrial facility. Additional stream monitoring is needed. Therefore, Tyson requests that the Designated Category be changed from a 5A to a 5D.

Response: EPA commends Tyson for reducing nitrate levels discharged from its Grannis facility. As mentioned above, a TMDL for nitrate was still required because the nitrate impairment for Rolling Fork has been on the 303(d) list since at least 1998 and it is included in the consent decree from the Arkansas TMDL lawsuit. As ADEQ noted in their Responsiveness Summary to Comments on the 2004 draft 303(d) list, the cyclical increases of nitrate between August and October each year are probably due to effects of Tyson's discharge during periods of decreased ambient streamflow to dilute the effluent.

Note: Tyson's Attachments A, B, and C are shown on the next three pages of this document.


Tyson Discharge
Attachment A
mg/l
40
35
30
25
20
15
10
5
0
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
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Feb-05
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Date
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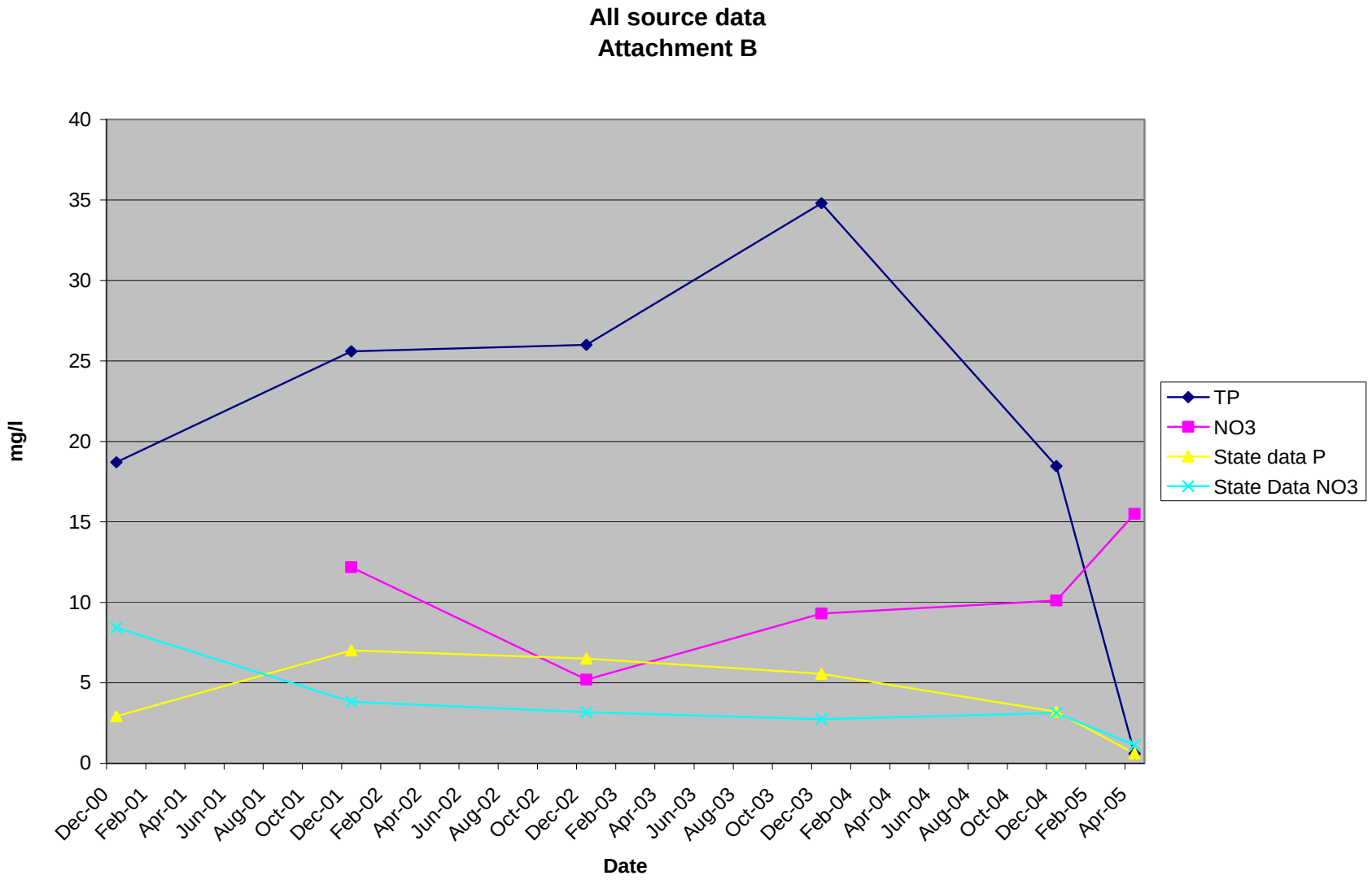
NO3


All source data
Attachment B
mg/l
40
35
30
25
20
15
10
5
0
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
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Jun-03
Aug-03
Oct-03
Dec-03
Feb-04
Apr-04
Jun-04
Aug-04
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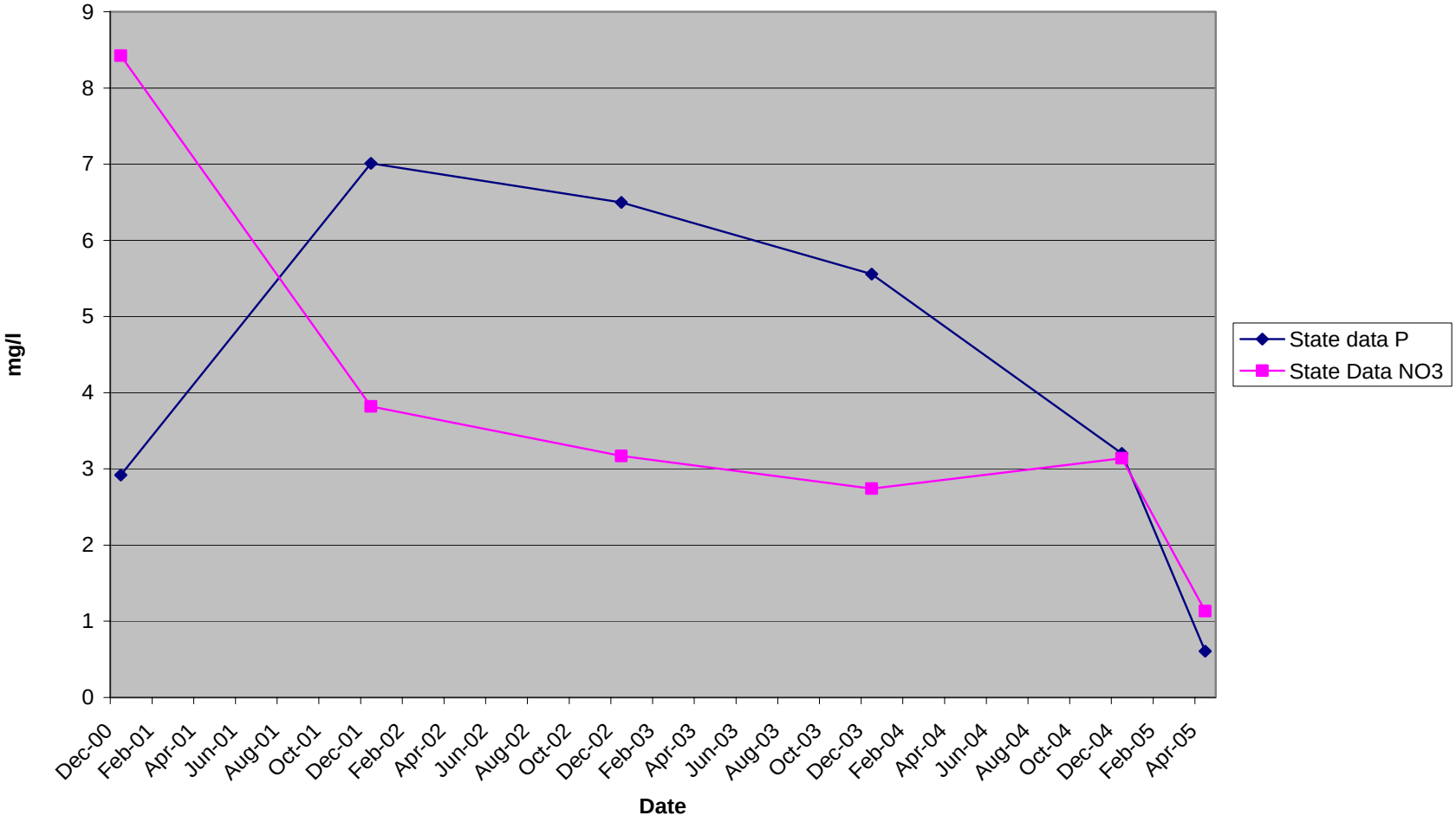
Dec-04
Feb-05
Apr-05
Date
TP
NO3
State data P
State Data NO3

State Data (RED58)
Attachment C



Tyson provides comments concerning Phosphorus as follows:

The basis for the phosphorus target for the TMDL is not a valid numerical water quality standard and is not a scientifically derived implementation of a narrative water quality standard. The 0.1 mg/L phosphorus target is not supported in the Arkansas standards. As acknowledged in the TMDL the 0.1 mg/L total phosphorus value was removed from the water quality standards. The value has never been a water quality standard but rather was used as a "guideline" for certain waters of the state. The 0.1 mg/L phosphorus target is not technically defensible. EPA supports the idea that the 0.1 mg/L target is not appropriate in all Ecoregions in Arkansas (EPA Rationale for making Listing Decisions, Region 6). In their Rationale for Listing Decisions EPA states that "EPA did not believe that application of the guideline values (i.e., the 0.1 mg/L phosphorus guideline for streams) was an appropriate approach."

The TMDL acknowledges that the 0.1 mg/L phosphorus guideline does not currently exist, but states that "it is still a reasonable benchmark for evaluating phosphorus levels in streams for the protection of aquatic life." This assumption is incorrect as there is no documented relationship between 0.1 mg/L phosphorus and protection of aquatic life that could be applied in the Rolling Fork. This point is further illustrated by the ADEQ in their public response to comments made in the April 9, 2004 Responsiveness Summary to Comments received from the Public Concerning proposed Changes to Regulation No. 2. In this document the ADEQ states that "Based on years of water division field data, the relationship between nutrient concentration and impairment is not necessarily directly correlated for streams. Therefore, at this time we feel numeric criteria are not appropriate." Furthermore, in their amendments to Regulation No. 2 the ADEQ has added language for determining impairments due to nutrients that considers factors such as "water clarity, periphyton or phytoplankton production, dissolved oxygen values, dissolved oxygen saturation, diurnal dissolved oxygen fluctuations, pH values, aquatic life community structure and possibly others." None of the listed determining factors were considered in the development of the TMDL target. In addition, no linkage between any of the listed determining factors and aquatic life impairment can be made if the aquatic life is not actually impaired, as it is not in the Rolling Fork downstream of the discharge. Therefore, based on the latest regulations of the ADEQ with input from EPA, the target for this TMDL is outdated and technically inappropriate. Without a valid phosphorus target as the basis for the TMDL, the resulting TMDL must also be invalid.

Response: The phosphorus TMDL in this report is being established to maintain Arkansas' narrative criteria for nutrients. Establishing a TMDL to comply with narrative criteria requires the development of a numeric endpoint. The endpoint for this TMDL is an estimate of the phosphorus that the stream can have and still maintain the aquatic life designated use. The 0.1 mg/L endpoint used in this TMDL was considered by EPA to be a reasonable goal that is not overly stringent. If a more appropriate numeric endpoint is

developed in the future, this TMDL can be revised at that time.

EPA agrees with the statements above that aquatic life impairments are usually due to a number of other factors in addition to phosphorus concentrations. The list of factors quoted above is presented in Regulation 2 for the purpose of determining impairment rather than developing TMDLs. The determination of impairment for this stream did rely on several different factors. The TMDL in this report is focused on phosphorus concentration as the endpoint rather than on other indicators of aquatic life impairment (e.g., large diurnal fluctuations of DO and pH, etc.) because the 303(d) listing for this stream cited phosphorus as a cause of impairment. Other indicators of aquatic life impairment are often the result of elevated phosphorus concentrations.

The waste load allocation for Tyson Foods for phosphorus presented in the TMDL is in conflict with the current Arkansas Water Quality Standards, and should be changed. The waste load allocation cites the facilities current permit which provides for a 2 mg/L average, 4 mg/L maximum limit for total phosphorus that is effective in 2007. The waste load allocation is the product of the facility flow multiplied by the 2.0 mg/L (then converted into pounds per day). However, the water quality standards for facilities less than 1.0 mgd provides that an effluent concentration of up to 5.0 mg/L and would not apply a loading cap on the facility should the facility flow be increased in the future. The Arkansas Water Quality Standard would allow the facility to discharge up to 3.0 mgd at a concentration of 2 mg/L. The effluent limitations and narrative standards at Reg. 2.509 are the Water Quality Standards for the state, not the 0.1 mg/L in stream guideline that was removed during a previous revision.

Response: APCEC Regulation 2.509 states that facilities with design flows of 1 to 3 MGD discharging into streams on the 303(d) list for phosphorus can have monthly average limits for total phosphorus **no greater than** 2 mg/L. This regulation does not prohibit a more stringent limit for phosphorus. The allowable effluent phosphorus concentration for Tyson in this TMDL (2.0 mg/L) is the same as the maximum allowable permit limit in Regulation 2.509.

Tyson has also made modifications at its Grannis processing facility that should be considered when considering the development of a Total Phosphorus TMDL. Tyson began voluntarily reducing the phosphorous from the wastewater treatment discharge in 2003. Tyson has eliminated the use of Tri-Sodium Phosphate (TSP) at the Grannis facility and the results indicate reduced in-stream concentrations according to data collected by ADEQ (Attachment A). In addition, Tyson has agreed to a long term limit of 2mg/l on their discharge beginning in 2007. Based on this information, Tyson believes

ADEQ should change the Designated Category from a 5A to a 5D and continue monitoring the stream condition.

Response: EPA commends Tyson for reducing phosphorus levels discharged from its Grannis facility. As mentioned above, ADEQ still considers this stream to be impaired based on submission of the 2002 303(d) list.

The load allocations (LA) found in the TMDL are not consistent with the background loads of nitrate and phosphorus calculated in the report. In Section 4.6, background loading is calculated as the average annual flow (71.4 mgd) times average nitrate and total phosphorus values from ambient monitoring station RED0022 (which is the Cossatot River station that has similar land-uses and topography to that of the Rolling Fork). The resulting background loads for nitrate and total phosphorus were 125 lbs/day and 35.7 lbs/day, respectively.

In the TMDL report these background levels were then simply compared to the load allocations, which were derived as the load remaining after the MOS and the waste load allocation (WLA) were removed from the TMDL, to determine if non-point source (NPS) load reductions were necessary. If the TMDL process had been carried through to proper completion, the background load should have been subtracted from the TMDL along with the MOS and the remaining loading (5,298 lbs/day of nitrate and 18.5 lbs/day of total phosphorus) should have been allocated among point and non-point sources.

In this TMDL, given that the Rolling Fork watershed land uses and topography are very similar to the Cossatot the background load should be the NPS load and given that no NPS reductions are necessary, the remaining load should be available to the only existing discharger, the Tyson Foods-Grannis Facility. Therefore, if the in stream targets were set correctly (see previous comments) the LA should be, at a minimum, set to the background loading and the WLA should be 5,298 lbs/day of nitrate and 18.5 lbs/day of total phosphorus.

Response: For clarification, it appears that “background” loading in the comments above refers to the total nonpoint source loading, which includes both natural background loading as well as nonpoint source loading caused by human impacts. The comments above appear to suggest that the load allocation for nonpoint sources should have been set equal to the existing nonpoint source loads (125 lbs/day of nitrate and 35.7 lbs/day of phosphorus) so that more loading could be allocated to the Tyson Grannis facility. This suggestion is not being used for these TMDLs because the resulting permit limits for the Tyson Grannis facility would be considered by EPA to be unreasonably high and not sufficiently protective of designated uses in the impaired reach of Rolling Fork as well as in downstream waterbodies. The rationale for the nitrate

WLA has already been discussed in responses above. The WLA for phosphorus was set based on the final limits that are already in the current permit for the Tyson Grannis facility.

Tyson provides the following comments concerning the development of a Copper TMDL:

ADEQ has 13 years to implement a TMDL or provide additional data as to why a TMDL should not be developed. Tyson would prefer that the Designated Category for Copper be changed to 5C due to concerns over the accuracy of the data that has been collected. Tyson believes that additional in-stream monitoring data should be obtained prior to a TMDL being developed for Copper. If additional data indicates Rolling River is impaired due to Copper concentrations, Tyson will monitor Copper concentrations in an effort to help ADEQ determine the source. If the in-stream concentration levels are above water quality standards and Tyson is identified as the source, a corrective action will be developed in conjunction with ADEQ. In the event that ADEQ does not change the Designated Category to 5C, Tyson requests that this listing be changed to 5D during this evaluation period.

Response: These comments are not relevant to the TMDLs in this report because a copper TMDL was not developed.

Tyson is requesting to work with ADEQ and EPA on assessing the water quality impacts associated with discharges from the Grannis processing plant mentioned in this letter. In the event that ADEQ determines that the processing plant is contributing to water quality impairments, Tyson would prefer to develop additional voluntary procedures in lieu of developing a TMDL.

The study cited in the TMDL report (ADPC&E, 1998) provides macroinvertebrate and fish community data downstream of the Tyson discharge at two locations in the Rolling Fork (Station RFK0002B and RED0030). The conclusion section of the ADPC&E report states that no impairments were determined for the study. No definitive qualitative or quantitative data was collected for algal productivity or periphyton community composition. Some diurnal dissolved oxygen data and pH data was provided and associated with high nutrient levels, but no linkage to algal productivity or aquatic life impairment was made. Comparison of the available aquatic community data from these (the downstream) stations to that of the upstream reference station (upstream of the discharge confluence) indicates no impairment exists, and further demonstrates improvement in the macroinvertebrate community at station 0030, the most downstream station. Subsequent macroinvertebrate collections completed in 2002 on the Rolling Fork by ADEQ appear to further support the conclusion that the aquatic life uses are fully supported downstream of the discharge.

Response: See response on page 1 of this document.

Tyson Foods would like to request a meeting with EPA to further discuss and clarify the points made above. Tyson requests that such a meeting be scheduled prior to the potential adoption of a TMDL for the Rolling Fork. My contact information is listed below.

Response: After these comments were received, EPA discussed these comments with the author of the letter by telephone on December 14, 2005. EPA will gladly discuss the TMDL with Tyson Foods further and answer any questions concerning the TMDL.

COMMENTS FROM ARKANSAS DEPARTMENT OF ENVIRONMENT QUALITY:

The Water Division staff has completed its review of the following draft TMDLs: Nitrate and Phosphorus in Rolling Fork; Phosphorus in Osage Creek near Berryville, Ar.; Phosphorus, Copper and Zinc for the Poteau River near Waldron, Ar.

Our comments are as follows:

In each of these studies, the value utilized as the phosphorus removal target is not a numerical water quality standard. In previous versions of Regulation #2, phosphorus was mentioned as a guideline, but was not--and is not--technically defensible due to varied (by ecoregion and individual watershed) responses by aquatic communities to instream nutrient concentrations. As a result, this guideline has since been removed in Arkansas' current water quality standards. TMDL validity must be based on addressing documented violations of existing Arkansas water quality standards and impaired use.

Response: The determination of impairment for the Rolling Fork was originally made by ADEQ a number of years ago. ADEQ considered this stream to be impaired because they included it in category 5a on the 2002 303(d) list. ADEQ still considers this stream to be impaired. It is in category 5a on the 2004 draft 303(d) list. During the public comment period for the draft 303(d) list, Tyson requested that the 303(d) listing for Rolling Fork be moved into category 5c or 5d. ADEQ rejected that request in their Responsiveness Summary to Comments on the draft 303(d) list (dated July 15, 2005). If a more appropriate numeric endpoint is developed in the future, the phosphorus TMDL in this report can be revised at that time.

Specific comments include (1) the stream segment below the Tyson discharge to Rolling Fork has had the domestic water supply source designation removed, thereby invalidating the instream TMDL target for nitrate-nitrogen, (2) the current 303d listing for metals in the Poteau River at Waldron is in the 5c category, which indicates questionable data due to QA/QC procedures, and may be resolved due to refinement of sampling techniques,

and (3) the Osage Creek TMDL (Berryville) contains numerous errors, erroneous data and inaccurate loading calculations.

Response: Only the first of the three comments above pertains to this report. As mentioned in Sections 4.2 and 4.5 of this report, ADEQ recommended the use of 10 mg/L as an appropriate limit for nitrate for this stream. Comment 2 above is addressed in the separate document, "TMDLs for Phosphorus, Copper, and Zinc for the Poteau River near Waldron, AR." Comment 3 above is addressed in the separate document, "TMDL for Phosphorus in Osage Creek near Berryville, AR."

All three of these point source dischargers have voluntarily agreed to develop/utilize technologies that effectively reduce nutrient loads to the receiving streams. ADEQ commends their willingness to initiate these procedures that will serve to enhance the protection of the instream aquatic communities, and prefers this approach to potential requirements dictated by technically invalid TMDLs.

The Water Division looks forward to continuing our long-standing working relationship with EPA. If you have any questions regarding the above comments, please feel free to contact me.

Response: EPA commends Tyson for reducing nitrate levels discharged from its Grannis facility. As mentioned above, a TMDL for nitrate was still required because the nitrate impairment for Rolling Fork has been on the 303(d) list since at least 1998 and it is included in the consent decree from the Arkansas TMDL lawsuit. As ADEQ noted in their Responsiveness Summary to Comments on the 2004 draft 303(d) list, the cyclical increases of nitrate between August and October each year are probably due to effects of Tyson's discharge during periods of decreased ambient streamflow to dilute the effluent.